# Software Testing and Verification

## Problem Set 4: Path Conditions and Symbolic Evaluation

1. In the pseudocode program segment below, assume that the variables X and Y are of type REAL.

```
                while Y>0.0 do
                    if X<0.0 then
(1)                     Y := Y+X
                    else
(2)                     X := X-1.0
                    end_if_then_else
                end_while_do
```

   a. Give the symbolic values of variables X and Y for each of the following program paths:

      i. T,T,T,T,F
      ii. T,F,T,T,F
      iii. T,T,T,F,F

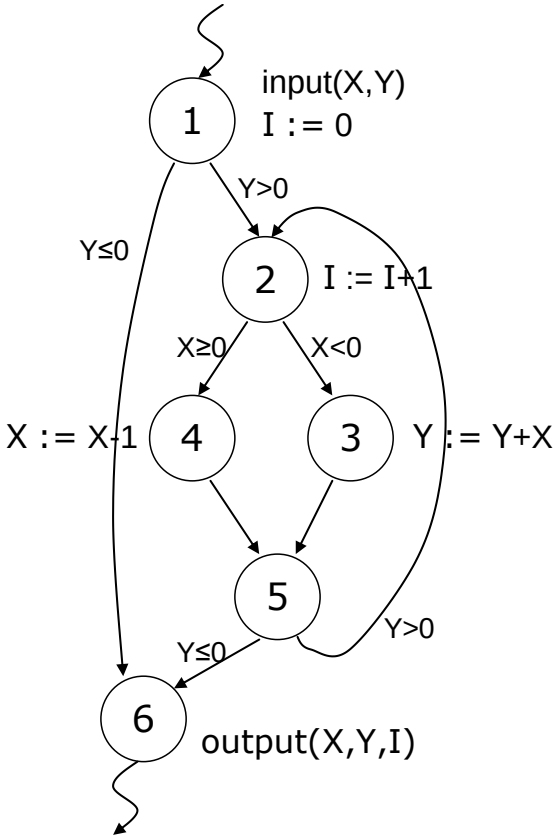
      Use double subscripts where appropriate as illustrated in Example 3 of Lecture 9 (White-Box Testing Techniques III).

   b. Give the path conditions for each of these paths using the symbolic values which the variables have *when the branch predicates are encountered during execution.* Then, using your results from part (a), give the path conditions in terms of the *initial* symbolic values of the variables.

   c. Graph the domain of path (i) in the $X_0$,$Y_0$ plane.

   d. Graph the domain of path (ii) in the $X_0$,$Y_0$ plane.

2. Recall the control-flow graph from Problem Set 3 below.




a. Give a path condition in terms of X,Y inputs for a test case that would cover the du path <4,5,2,3,5,6> for the du-pair X: (4,6) AND that would traverse edge <2,4> exactly twice.

b. Give integer input values for X and Y that would result in this path being covered.